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ABSTRACT

This report focuses on teacher reactions in the Mississippi Delta to the state-wide curriculum and testing program. A Basic Skills Assessment Program tests achievement of the state curriculum objectives at grades 3, 5, 8, and 11. Eleventh grade students are also required to pass a Functional Literacy Examination for each content area. Mathematics objectives for each of the five assessments are appended. The project team engaged in five activities: (1) telephone interviews with administrators and teachers in the 24 Delta school districts; (2) analyses of mathematics achievement and demographic data bases; (3) preliminary study of mathematics attitudes and their impact on mathematics achievement, (4) construction and distribution of a written survey for Delta teachers; and (5) analyses of the teacher survey. Selected findings from each of these activities are presented, plus a general summary and recommendations. (MNS)

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TEACHER EVALUATION OF MATHEMATICS CURRICULUM OBJECTIVES

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The present report was based on findings from a contract between the State Department of Education in Mississippi and Delta State University entitled, "Mathematics Needs Assessment for the Mississippi Delta". The project was funded on February 8, 1988 as a continuation of state priorities for mathematics improvement. A previous report, "School District Variables As Predictors of Mathematics Achievement" identifies factors associated with improvement (Jones, Messer, Hart-Hester, and Lander, 1988). That report emphasized data base analyses of student scores on the Basic Skills Assessment Program (BSAP) in Mississippi. This report focuses on teacher reactions to that state wide curriculum and testing program. More complete technical information on both the previous and the present report may be obtained in the Final Project Report on File with the Mississippi State Department of Education in Jackson, Mississippi. Specific contacts should be directed to the Bureau of Planning and Policy and the Bureau of School Improvement, who collaborated in sponsorship of the contract. The opinions and findings expressed in these reports are the opinions of the Principal Investigator (Jones).

Mathematics performance has traditionally been poor in Mississippi public schools, owing to economic depression and a history of school drop outs (Jones, 1988). However, Mississippi has taken extensive steps to improve that situation. In 1982, the legislature passed the Education Reform Act.

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This law provided for the development of a state wide curriculum in all content areas and for implementation of a performance-based accreditation system (Hebbler, 1985). Morse (1986) has reported on the use of this model in instructional management. Amos (1986) has reported on initial evaluations of the system.

The Mississippi Model provides for a Basic Skills Assessment Program to test achievement of the state curriculum objectives at grades 3, 5, 8, and 11. Additionally, 11th grade students are required to pass a Functional Literacy Examination (FLE) for each of the content areas. Appendix A presents the Mathematics objectives tested on each of these five assessments.

The Mississippi Delta is a rural area with extreme economic depression and academic performance deficits. In terms of percent of families below the poverty level, the poorest counties in the United States are found in this region. Teaching in such a location provides many frustrations in addition to those encountered in other school districts around the country. Part of the needs assessment researched under the SDE contract asked for teacher evaluation of the State Mathematics Curriculum and BSAP testing in terms of the specific problems found in the Delta. The Project Team engaged in five activities: 1) telephone interviews with administrators and teachers in the 24 Delta school districts, 2) analyses of mathematics achievement and demographic data bases (previously reported by Jones, et al, 1988), 3) preliminary study of mathematics attitudes and their impact on mathematics achievement, 4) construction and distribution of a written survey for Delta teachers, and 5) analyses of the teacher survey.

SELECTED FINDINGS

The following findings of the project were selected from information presented in the Final Report. The findings are organized under relevant project activities.

Activity One: Telephone Interviews

1.1 Administrators and designated mathematics teachers do not differ statistically in their overall response to a broad variety of issues related to mathematics instruction. (see Table 1).

1.2 Administrators and designated teachers appeared to assign highest priorities to items concerning curricular structure, moderate priorities to items concerning administrative concerns, and lowest priorities to items involving continuing education for teachers.

1.3 Many spontaneous comments were made concerning the need for more teacher-ready materials rather than more workshops on mathematics pedagogy, concepts, theories, and research.

Activity Two:[2] Analyses of Achievement and Demographic Data Bases

Statewide Results

2.1 There has been annual improvement in achievement scores since the Education Reform Act became law.

2.2 Mathematics achievement scores appear to decrease with increasing grade level, although interpreting that data is a treacherous undertaking. For one thing, no attempt has been made to determine the relative difficulty of tests from grade to grade. A second issue is that weaker students drop out before finishing high school. Therefore 11th grade BSAP averages do not include the grades of many drop outs, resulting in what appears to be higher performance. It is even possible for a poor school with a high drop out rate to have a higher average BSAP score than a good school with a low drop out rate.

2.3 District score reports for Stanford Achievement Tests at Grade 1 (all subtests) show severely diminished variability, greatly undermining the effectiveness of those test scores for district level decisions. No other tests or subtests show this problem. Individual student decisions may not be affected.

2.4 Mathematics achievement tests (Stanford, BSAP, and FLE) at all levels were highly intercorrelated, and may be effectively used to predict future performance of districts. This finding also provides broad support for their concurrent validity when used with Mississippi student populations.

2.5 Achievement tests of all types (eg Reading, Written Communication, Mathematics) are highly intercorrelated, suggesting that overall achievement is a general student attribute which should be considered in decisions concerning specific achievement in mathematics.

2.6 Economic and ethnic factors are strongly related to all areas of achievement, including mathematics.

2.7 Among BSAP subtests, Written Communications often shows the highest intercorrelation with Mathematics. Reading achievement is a close second. The same pattern was noted for regression analyses.

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[2]Data not included here. See Jones, et al, 1988.

TABLE 1

RANKS OF SPECIFIC MATHEMATICS EDUCATION RECOMMENDATIONS
TELEPHONE INTERVIEWS - ADMINISTRATORS AND TEACHERS COMBINED SCORES

VARIABLE	MEAN [1]	STD. DEV.	DESCRIPTION
V20	4.125000	.904272	----- Required remediation for low BSAP Scores
V17	4.083333	.985392	----- Teachers need incentives for math institutes
V25	4.062500	.747391	----- Need more math college preperatory courses
V15	4.041667	.815433	----- Link between reading & math needed (K-6)
V19	4.020833	.691905	----- Need annual review of math performance
V24	3.865167	.978723	----- Revise 8 & 11 Math Bsap to match curriculum
V23	3.854167	.957200	----- Need test-taking skills in mathematics
V13	3.833333	.745356	----- More emphasis needed on problem solving
V32	3.833333	.772802	----- Need curriculum help for math goals
V26	3.770833	1.004979	----- Need newsletter on math instructions
V22	3.750000	.924211	----- Need more student math competitions
V31	3.708333	.815433	----- Need administrative help for math goals
V14	3.687500	.869776	----- Need symposium on math in the workplace
V21	3.687500	.845484	----- Need network for research in math teaching
V18	3.666667	.942809	----- Recognition needed for good math teachers
V30	3.625000	.949232	----- Absences for math workshops discouraged
V16	3.504167	1.015291	----- K-6 teachers need in-service on algebra, etc.
V29	3.458333	.924486	----- Teacher interest in math staff development
V28	3.354167	.901147	----- Problems with K-6 teacher math attitudes
V27	2.750000	1.145644	----- Problems with math teachers out of field

[1] Alternatives ranged from 1="very low priority" to 5="very high priority".

METHOD: One teacher and one administrator were designated by the Superintendent for each of the 24 Delta School Districts. Items were scored as above. A Multivariate Analysis of Variance (MANOVA) was used to compare teachers with administrators on the overall response patterns for 30 items. The overall test for comparison was not significant (Pillai-Bartlet Trace = 1.76980; p = .10876). Consequently, responses of the two groups were combined to produce the results above.

2.8 Stepwise regressions were used to determine the key district-level predictors of BSAP and FLE Mathematics scores. The best predictor was usually the district average on the most recent administration of the Stanford Achievement Test in Mathematics. Percentage of students in the district on Free Lunch was a close second.

Results For The Delta

2.9 Comparing the Delta to statewide data, five general trends were noted: a) greater economic depression, b) much higher drop out rate, c) older teachers, d) greater federal support, and e) much lower achievement scores on all tests, including mathematics. The same pattern of test results was replicated for a previous year (1985-1986) of data.

2.10 Mathematics achievement test scores are about 8% lower in the Delta when compared to statewide results. This difference is present at Kindergarten testing and remains relatively stable over the entire range of grades.

2.11 Only the very best public school students in the Delta go on to take the ACT for college admissions. Thirty-eight percent have already dropped out, and only 56 percent of the remaining seniors take the ACT. Of that highly selected group, students in the Delta obtained an average standard score of only 10.74 (compared to a national average of 18.54) on the Mathematics ACT subtest.

2.12 Even though there has been improvement in basic mathematics skills achievement in the Delta, problem solving and higher cognitive skills remain seriously affected, as noted in 2.11 above.

2.13 District variables in the Delta show a similar pattern of correlations to statewide mathematics (and other achievement) tests. In some cases, economic variables are actually better predictors of mathematics achievement than are previous mathematics achievement test results.

Observations on the Mathematics Curriculum Objectives

2.14 Analysis of mathematics curriculum objectives tested by the BSAP indicate that the greatest problems occur in basic skills involving detail work, such as fractions, decimals, and rounding off numbers. These problems are present at all grade levels.

2.15 A second mathematics achievement deficiency appears in word problems, tested at higher grade levels. Many teachers cite this deficiency as a reason to link the teaching of reading with mathematics in the Elementary Grades.

2.16 A third general achievement deficiency appears in metric relationships at lower grades. This problem does not show up in higher grades and is considered a relatively minor concern when compared to 2.14 and 2.15.

2.17 Factor analysis views a different aspect of the same data. While paragraphs 2.14, 2.15, and 2.16 identify patterns of objectives most often missed, factor analysis identifies groups of objectives that best account for overall achievement scores. At each of the four BSAP test levels, one factor emerges that accounts for at least 50% of the variation in BSAP scores. By grade level, those factors were described as Mathematics Knowledge (3rd grade), Computational Skills with Whole Numbers (5th grade), Computational Skills with Details such as fractions, decimals, and rounding off (8th grade), and Computational Skills with Details (11th grade).

2.18 The timetables for mastery of State Curriculum Objectives in all areas are very unevenly distributed throughout the grades. This has led to a concentration of district efforts in mathematics at grades 3, 5, 8, and 11. Apparently, this was intended to dovetail with BSAP testing, which occurs in those same grades. Unfortunately, this practice leads to a number of problems. (Table 2)

Activity Three: Study of Attitudes and Mathematics Achievement

3.1 A small study involving four classes of elementary students at four different schools showed no relationships between mathematics attitudes and mathematics achievement on basic skills.

3.2 It was argued that BSAP skills were satisfactorily attained by most students in this study, restricting the range of variation. A more challenging test of mathematics achievement would not be limited in this fashion and would probably show some relationship between attitude and achievement.

Activity Four: Construction and Distribution of Teacher Survey

4.1 Items, sources for items, and construction of the Written Teacher Survey are discussed. (Appendix B)

4.2 Distribution procedures for written survey are described.

Activity Five: Analyses of Teacher Survey Data

5.1 Elementary Teachers in grades K, 1, 2, 4, and 6 only average 0.63 mathematics courses beyond general education requirements at their schools of teacher education.

5.2 Elementary Teachers with the strongest mathematics backgrounds are typically placed in grades 3 and 5 in the Delta. Those teachers averaged 2.23 extra mathematics courses.

5.3 Elementary teachers in K, 1, 2, and 4 are MORE THAN TWICE AS LIKELY to judge mathematics curriculum objectives as inappropriate than are teachers in grades 3, 5, and 6. (Table 3)

5.4 Teachers at both Elementary and Secondary Grades gave strong support to the following recommendations for improving mathematics instruction: A) Need required remediation for low BSAP scores, B) Need teacher-ready reteaching materials, C) Need data on specific objectives most often missed, D) Need teacher-ready testing materials on all objectives (not just those tested on BSAP). Other mathematics recommendations were supported more strongly by Secondary Teachers, whose teaching was usually restricted to mathematics courses. (Table 4)

5.5 Elementary Teachers were more likely to judge their students as being "on schedule" or "ahead of schedule" with regard to basic mathematics skills than were Secondary Teachers.

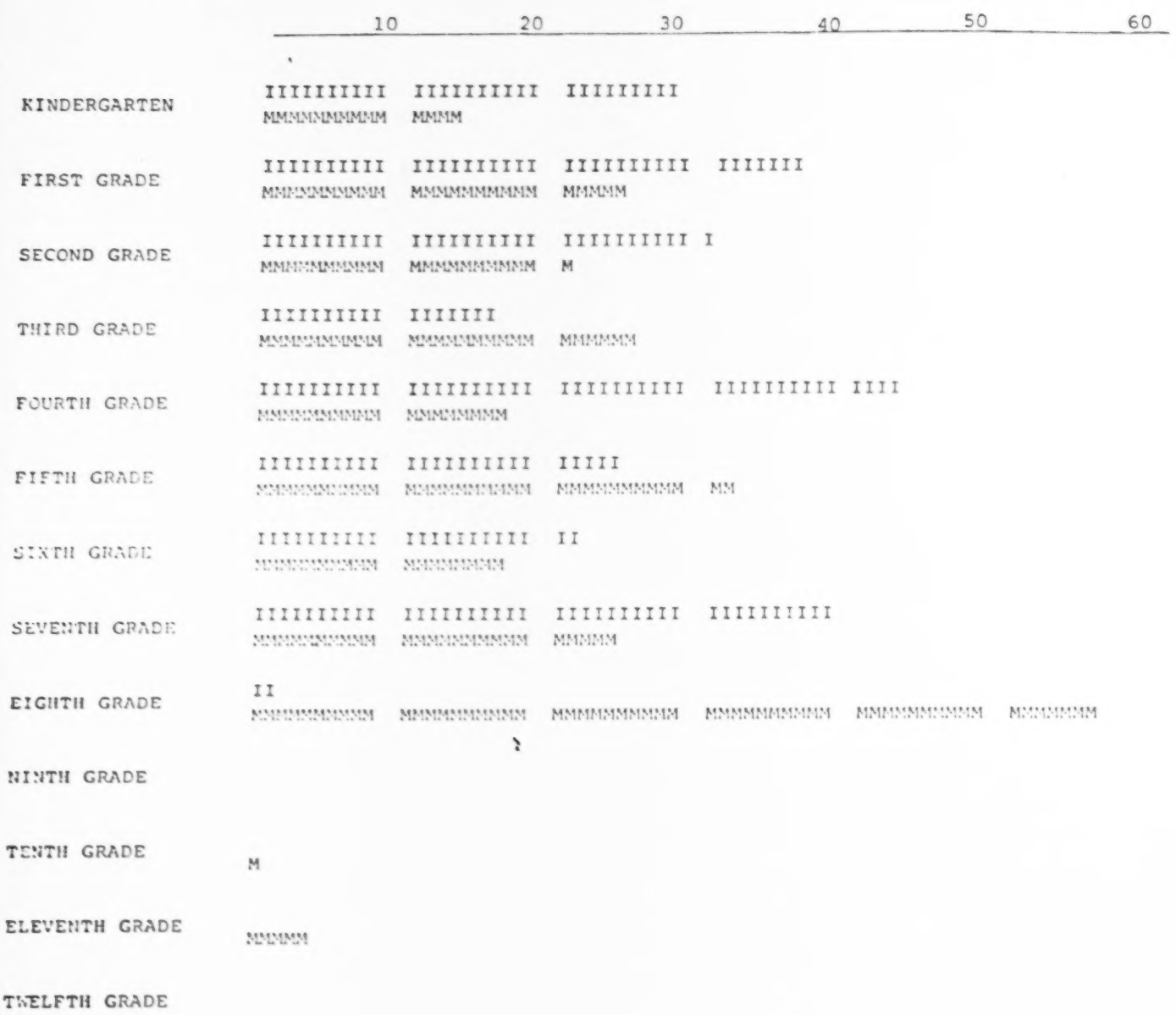
5.6 Teachers who more often consider mathematics curriculum objectives "Inappropriate" are generally LESS interested in more continuing mathematics education for teachers and LESS interested in student data on mathematics performance. These teachers most often taught at the elementary level. (Table 5, Model 1)

5.7 Teachers who prioritize "problem solving" were more likely to support required remediation, teacher-ready reteaching materials, and linking mathematics with reading instruction. These were usually Secondary Teachers. (Table 5, Model 6)

5.8 Teachers who rated their students more highly on basic mathematics skills were generally LESS interested in required remediation, and LESS interested in taking more mathematics courses or other continuing mathematics education work. (Table 5, Model 10)

TABLE 2

NUMBER OF MATHEMATICS OBJECTIVES INTRODUCED AND MASTERED BY GRADE



I-one objective introduced
M-one objective mastered

TABLE 3

MATHEMATICS OBJECTIVES JUDGED "INAPPROPRIATE" BY GRADE LEVEL

GRADE LEVEL[1]	MEAN	S.D.	N	PERCENT INAPPROPRIATE 0 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20
Kindergarten	17.4646	9.429	99	xxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxx
1st Grade	14.2590	8.654	139	xxxxxxxxxxxxxxxxxxxxxxxxxxxx
2nd Grade	11.6587	10.107	126	xxxxxxxxxxxxxxxxxxxxxx
3rd Grade[2]	5.9847	8.510	131	xxxxxxxxxxxx
4th Grade	11.9794	14.548	97	xxxxxxxxxxxxxxxxxxxxxx
5th Grade[2]	6.6061	9.349	66	xxxxxxxxxxxxx
6th Grade	6.4464	10.175	56	xxxxxxxxxxxxx
7th Grade	6.5625	8.090	48	xxxxxxxxxxxxx
8th Grade[2]	7.4242	10.115	33	xxxxxxxxxxxxxx
Algebra 1	7.5882	11.309	17	xxxxxxxxxxxxxx
Algebra 2	5.8333	8.451	12	xxxxxxxxxxxx

1 Teachers were asked to respond to the lowest grade level taught when they taught more than one course. While this assisted in evaluating the data by allowing statistically independent observations, the procedure led to very few responses in higher level mathematics courses. Those courses not shown had a response rate of less than 10.

2 These grades are tested on the BSAP Mathematics Test.

TABLE 4

RESULTS OF TEACHER SURVEY CONCERNING MATHEMATICS INSTRUCTION
IN THE MISSISSIPPI DELTA

TEACHER VARIABLES	MEAN	SD	N	DESCRIPTION [1]
AGE	40.11	9.01	734	Self-reported age of teacher.
YRSTEACH	15.19	8.87	847	Number of years teaching.
EMERCERT	.04	.20	859	Hold emergency certification.
MATHTAKE	2.57	3.21	861	Extra math courses taken in college.
INAPPROP	10.39	10.89	896	Number "inappropriate" objectives at teacher's grade level.

RESULTS OF SURVEY RESPONSES VARIABLES	MEAN	RANK [2]	SD	N	DESCRIPTION
REQREMED	4.14	1	.94	896	Need required remediation for low BSAP.
RETEACH	4.09	2	.92	896	Need teacher-ready re-teaching materials
OBJECTIV	3.83	3	.94	896	Need data on specific objectives missed.
TESTING	3.81	4	.97	896	Need teacher-ready testing materials.
TEXTEVAL	3.77	5	1.04	896	Need evaluation of math textbooks.
PROBLEM	3.63	6	.91	896	Need more emphasis on Problem-Solving.
STAFFDEV	3.61	7	.88	896	Integrate Staff Dev. and Instruction.
MATHREAD	3.51	8	.95	896	Link teaching of reading with math.
UNIVERSI	3.51	9	.95	896	Desire help from Universities on math.
NEWSLETT	3.50	10	1.03	896	Need Mathematics Newsletter.
ABSENCE	3.47	11	1.04	896	Workshop absences should be encouraged.
RESEARCH	3.40	12	.96	896	Need research reporting network.
CONEDUC	3.36	13	.91	896	Need incentives for continuing education.
REGDATA	3.34	14	.95	896	Need regional data on math performance.
WORKMATH	3.10	15	.94	896	Need symposium on math in workplace.

ESTIMATE OF STUDENT BASIC SKILL MASTERY					
SKILLS	2.82 [3]		.75	896	Estimate of basic skill mastery where 1=far behind;2=behind;3=on schedule; 4=ahead; and 5=far ahead.

1 Refer to Appendix G for full description.
2 Items ranked 1 through 4 received broad support from both Elementary & Secondary Teachers. Items ranked 5 through 15 were supported more strongly by Secondary Mathematics Teachers.
3 Elementary Teachers were more likely to rate their students as "on schedule" or "ahead".

TABLE 5

SUMMARY OF REGRESSIONS FOR SURVEY ITEMS
STEPWISE PROCEDURE

MODEL #	DEPENDENT VARIABLE	R	R^2 ADJUSTED FOR SHRINKAGE	F of REGRESSION with df	SIGNIFICANT INDEPENDENT VARIABLES (IN ORDER) with BETA WEIGHT
1	INAPPROPRIATE	.19387	.03301	8.211 (4,841) p =.0000	REGDATA (-.09426) CONED (-.08030) YRSTEACH(-.07904) PROBLEM (-.07793)
2	REQREMED	.53264	.27686	41.439 (8,837) p =.0000	PROBLEM (.20433) CONED (.15412) RETEACH (.15575) MATHREAD(.13501) RESEARCH(.13501) STAFFDEV(.07468) SKILLS (-.07681) MATHTAKE(-.06878)
3	OBJECTIV	.68450	.46217	73.613(10,835) p =.0000	REGDATA (.35349) RETEACH (.19015) NEWSLET (.12203) WORKMATH(.07408) TESTING (.10724) REQREMED(.05098) UNIVERS (.06930) SKILLS (-.06346) MATHREAD(-.07115) MATHTAKE(-.05344)
4	TESTING	.71216	.50483	216.371 (4,481) p =.0000	RETEACH (.58998) OBJECTIV(.11955) UNIVERS (.07117) NEWSLETT(.06646)
5	TEXTEVAL	.52113	.26724	62.635 (5,840) p =.0000	REGDATA (.28438) RETEACH (.15939) WORKMATH(.12111) NEWSETT (.09820) UNIVERS (.09485)
6	PROBLEM	.46819	.21362	39.257 (6,839) p =.0000	REQREMED(.23879) MATHREAD(.19048) WORKMATH(.16478) RETEACH (.09522) NEWSLETT(-.07367) SKILLS (-.06529)
7	STAFFDEV	.56252	.30824	38.653(10,835) p =.0000	ABSENCE (.22786) NEWSLETT(.11849) UNIVERS (.11257) REQREMED(.06441) WORKMATH(.06210) RETEACH (.07573) MATHTAKE(-.08387) MATHREAD(.07428) RESEARCH(.03254) REGDATA (.06887)

TABLE 5
Continued

SUMMARY OF REGRESSIONS FOR SURVEY ITEMS
STEPWISE PROCEDURE

MODEL #	DEPENDENT VARIABLE	R	R^2 ADJUSTED FOR SHRINKAGE	F of REGRESSION with df	SIGNIFICANT INDEPENDEN VARIABLES (IN ORDER) with BETA WEIGHT
8	MATHREAD	.52859	.27252	40.568 (8,837) p =.0000	WORKMATH (.20955) PROBLEM (.16337) REQREMED (.11739) MATHTAKE (.11738) OBJECTIV (.10356) CONED (.09979) YRSTEACH (.06823) STAFFDEV (.07419)
9	CONED	.59095	.34222	49.847 (9,836) p =.0000	ABSENCE (.27035) REQREMED (.13855) WORKMATH (.10958) RESEARCH (.10448) UNIVERS (.09609) MATHREAD (.08307) TESTING (.07863) SKILLS (.06635) INAPPROP (-.06596)
10	SKILLS	.16906	.02396	6.186 (4,841) p =.0000	MATHTAKE (-.09948) NEWSLETT (.09039) REQREMED (-.11614) CONED (.08800)

GENERAL SUMMARY AND RECOMMENDATIONS

The Mississippi Delta is greatly affected by both economic and educational heritages which greatly diminish all achievement, including mathematics. There has been modest improvement in basic skills, but great problems remain. The deficits are present during Kindergarten, before school districts even have a chance to begin working with the students.

Specific difficulties with mathematics objectives begin to emerge in the 3rd grade BSAP scores, showing what we have called a "lack of attention to detail". Basic skills objectives most often failed included work with fractions, decimals, and rounding off numbers. It is as though the student feels that getting an answer correct to the nearest whole number is "close enough". This deficit continues through all BSAP and FLE testing. A second area of difficulty emerges during eighth grade BSAP testing involving difficulties with "word problems". It is suggested that a closer relationship between the teaching of reading and mathematics might have some ameliorative effects. Third, difficulties with the metric system show up in BSAP scores at the lower grades. This was not considered a major problem, and it may well be related to a general "lack of attention to detail". Factor analytic results were presented which support this interpretation.

Our survey showed that Elementary Teachers were far less concerned with mathematics instruction than were Secondary Teachers, and that they had far less preparation in mathematics. These trends were understandable, since Elementary Teachers have many other curriculum areas to consider. Additionally, Elementary Teachers might be overlooked in decision-making concerning mathematics instruction because they lack formal coursework in mathematics.

Any long-range solution to problems in mathematics achievement will have to enlist the classroom experience and cooperation of Elementary Teachers.

The State Mathematics Curriculum seems to be rather well accepted by most teachers, although the BSAP testing program is producing some undesireable side effects with regard to mathematics. Elementary Teachers with the best mathematics background (and probably the greatest mathematics interest) wind up assigned to the 3rd and 5th grades, when the BSAP is given. We believe that mathematics instruction is getting "short-changed" in many districts at the other elementary grade levels (K, 1, 2, and 4). A continuous emphasis will be required for sustaining improvements.

Recommendations

1. Required remediation is supported at all levels, and that emphasis should be continued by the state department.

2. Elementary Teachers need to be as actively involved in mathematics decision-making as is possible, and at all levels (school, district, and state).

3. As much emphasis as possible needs to be placed on Elementary Mathematics and the State Mathematics Curriculum in Mississippi's Schools of Teacher Education. Early Childhood Education curricula need to emphasize the importance of positive teacher attitudes toward mathematics. In general, mathematics appears to be one of the least preferred subjects for Elementary Teachers. It is certain that in many cases, their students are aware that the teacher does not emphasize the topic, and it is equally certain that the students will then find themselves less ready to extend the effort required for satisfactory mathematics achievement.

4. Teacher-ready materials for reteaching mathematics objectives be made available to all teachers. The first efforts should be made with regard to what we have called "detail work" (fractions, decimals, and rounding off) at the Elementary Levels.

5. Teacher-ready testing materials need to be provided for effective ANNUAL monitoring of mathematics progress. Too much of the load has been placed on 3rd and 5th grade teachers. By making these materials available to teachers in other grades, the school and district can monitor mathematics progress internally. This would allow schools to remediate before external monitoring (grades 3 and 5) with the BSAP tests might threaten accreditation.

6. A second thrust in the area of teacher-ready materials should occur with regard to "word problems". However, we would recommend that these efforts be coordinated with a study of the possibilities of linking the teaching of reading to the teaching of mathematics in the elementary grades. We believe that such a plan is needed, and that it will require a major effort. A haphazard set of materials would be pointless and would frustrate teachers.

7. Objectives concerning the metric system are important but do not contribute substantially to overall mathematics achievement. We believe that emphasis on metrics should wait until substantial progress has been made on Recommendations 4, 5, and 6.

8. Annual practice tests on objectives and software for annual monitoring of student progress should be made available. The SDE has developed TIP packages for each BSAP objective, making such an undertaking feasible. The monitoring software would relieve some of the overwhelming paperwork burden that accompanies tracking of individual student mathematics achievement.

9. We do not think that requiring currently employed Elementary Teachers to take additional course work in mathematics is a particularly good idea for the short range. Of course, the Elementary Teachers did not rate that idea very highly either. The concept has merit, but it seems to be an indirect and long range solution to a very immediate and pressing problem.

10. The SDE needs to establish a highly visible office for coordinating mathematics affairs in the public schools. That office could serve as a contact, collect resources from mathematics projects, and promote sharing of resources on a state-wide level. At present, much of the good work done in mathematics education for one part of the state is unknown in other parts of the state.

11. The SDE should contract for an annual mathematics evaluation contract, identifying problem areas, charting progress, and disseminating results to the districts, the SDE, and Schools of Teacher Education. Mississippi is already ahead of most states in that we already have an approved mathematics curriculum, a state-wide testing program keyed to that curriculum, and a mathematics achievement data base in place. We have done the hard things, and we should reap the benefits of those efforts for systematic planning and evaluation.

12. Long-range planning for mathematics improvement needs to adopt specific goals. Planning should be based on available data, input from the SDE, school administrators, and from both Secondary and Elementary teachers. These plans should incorporate the recently revised Standards of the National Council of Teachers of Mathematics (NCTM). It should be noted that a recent description of those standards (Thompson and Rathmell, 1988) takes a somewhat different emphasis than presently used in the Mississippi State Curriculum Objectives.

REFERENCES

Amos, Neil G. (1986). An Analysis of the Mississippi Performance Based School Accreditation Model (Symposium). Abstract published in the Proceedings of the MidSouth Educational Research Association.

Hebbler, S. W. (1985). Field Testing of a Performance Based Accreditation Model (Symposium). Abstract published in the Proceedings of the MidSouth Educational Research Association.

Jones, J. R. (1988). Mathematics Needs Assessment For The Mississippi Delta: Final Report. Bureau of Planning and Policy and Bureau of School Improvement, State Department of Education, Jackson MS.

Jones, J. R., Messer, P., Hart-Hester, S., and Lander, D. (1988). School District Variables As Predictors of Mathematics Achievement. A paper presented at the MidSouth Educational Research Association, Louisville, KY. Abstract published in the Proceedings of the MidSouth Educational Research Association.

Morse, L. W. (1986). Implementing Instructional Management: Viewpoints From Three Perspectives (Symposium). Abstract published in the Proceedings of the MidSouth Educational Research Association.

APPENDIXES

APPENDIX A

MATHEMATICS - BASIC

3-1. Identify place value of a given digit in three- or four-digit numeral
3-2. Identify number words through thousands
3-3. Use <, >, or = to compare two numbers
3-4. Use the symbols +, -, ÷, $\sqrt{\ }$ or x
3-5. Identify fractional parts from halves through fifths
3-6. Add through 3-digit whole numbers, regrouping as necessary
3-7. Subtract through 3-digit whole numbers, regrouping as necessary
3-8. Multiply using basic facts through 5 x 9
3-9. Divide using basic facts through 45 ÷ 9
3-10. Identify circles, triangles, rectangles, or squares
3-11. Tell time to the hour, half hour, or quarter hour
3-12. Measure length to nearest centimeter or inch
3-13. Select the appropriate unit of measure (English or metric) for problems involving length
3-14. Make change up to one dollar
3-15. Compare relationships among coins up to one dollar: pennies, nickels, dimes, quarters
3-16. Compare relationships among calendar units: days, weeks, months, years
3-17. Solve word problems involving whole numbers, using one of the basic operations

MATHEMATICS - BASIC

5-1. Read and write numerals through 1,000,000
5-2. Round numbers to nearest ten, hundred, or thousand
5-3. Change improper fractions to mixed numbers
5-4. Simplify proper fractions
5-5. Add up to four 5-digit whole numbers, regrouping as necessary
5-6. Subtract through 5-digit whole numbers, regrouping as necessary
5-7. Multiply through 3-digit by 2-digit whole numbers, regrouping as necessary
5-8. Divide by a 1-digit whole number divisor
5-9. Divide by a multiple of ten
5-10. Add two fractions with like denominators, renaming the sum as a mixed number or simple fraction; subtract two fractions with like denominators
5-11. Add with decimals through hundredths; subtract with decimals through hundredths
5-12. Tell time to the nearest minute
5-13A. Identify relationships between English or metric units of measure: capacity: pint, quart, gallon; or milliliter, liter
5-13B. Identify relationships between English or metric units of measure: length: inch, foot, yard; or millimeter, centimeter, meter
5-13C. Identify relationships between English or metric units of measure: weight: ounces, pounds; or grams, kilograms
5-14A. Identify relationships between English or metric units of measure: capacity: pint, quart, gallon; or milliliter, liter
5-14B. Identify relationships between English or metric units of measure: length: inch, foot, yard; or millimeter, centimeter, meter
5-14C. Identify relationships between English or metric units of measure: weight: ounces, pounds; or grams, kilograms
5-15. Determine weight to the nearest pound or kilogram; measure length to the nearest centimeter or quarter inch
5-16. Read temperature on Fahrenheit and Celsius scales
5-17. Solve word problems involving whole numbers, using one operation
5-19. Solve word problems involving money, using addition and subtraction
5-20. Interpret bar graphs, pictographs, or circle graphs

MATHEMATICS - BASIC

8-1. Round numbers to a specific place; estimate sum and difference of whole number computational problems
8-2. Identify equivalent fractions, decimals, and percents
8-3. Simplify any given fraction or mixed number
8-4. Add, subtract, multiply, and divide whole numbers
8-5. Add, subtract, multiply, and divide fractions; add, subtract, multiply and divide mixed numbers
8-6. Add, subtract, multiply, and divide decimals
8-7. Simplify expressions involving more than one operation
8-8. Measure temperature, length, capacity, or weight, using metric or English units
8-9A. Solve word problems involving whole numbers, using one or two operations
8-9B. Solve word problems involving decimals, using one or two operations
8-9C. Solve word problems involving money, using the basic operations
8-9D. Solve word problems involving metric or English units of length, weight, or capacity, using the basic operations
8-10A. Solve word problems involving fractions, using one or two operations
8-10B. Solve word problems involving mixed numbers, using one or two operations
8-11. Solve word problems involving percent, using one or two operations
8-12. Solve word problems involving time, using the basic operations
8-13. Interpret bar graphs, line graphs, pictographs, or circle graphs
8-14. Complete a check and its stub

MATHEMATICS BASIC

11-1. Round numbers to a specific place, and estimate answers to whole number computational problems
11-2. Identify equivalent fractions, decimals, or percents
11-3. Add, subtract, multiply, and divide whole numbers
11-4. Add, subtract, multiply, and divide fractions
11-5. Add, subtract, multiply, and divide mixed numbers
11-6. Add, subtract, multiply, and divide decimals
11-7. Solve equations involving one variable
11-8. Compute the perimeter and/or the area of any given triangle, or quadrilateral, given the appropriate formula
11-9A. Solve word problems involving whole numbers, using one or two operations
11-9B. Solve word problems involving decimals, using one or two operations
11-9C. Solve word problems involving money, using one or two operations
11-10A. Solve word problems involving fractions, using one or two operations
11-10B. Solve word problems involving mixed numbers, using one or two operations
11-11. Solve word problems involving percentages, using one or two operations
11-12. Solve word problems involving time, using the basic operations
11-13A. Solve word problems involving metric or English units of length, using the basic operations
11-13B. Solve word problems involving metric or English units of weight, using the basic operations
11-13C. Solve word problems involving metric or English units of capacity, using the basic operations
11-15. Interpret bar graphs, line graphs, pictographs, or circle graphs

MATHEMATICS - FUNCTIONAL

FL-1. Complete a check and its stub
FL-2. Calculate take-home pay when given hourly, weekly, or monthly wage and the deductions
FL-3. Calculate selling price when given list price, sales tax rate, and/or rate of discount on an item
FL-5. Calculate monthly payments over a specified period of time when given total cost
FL-6. Calculate the balance of a personal checking account when given initial balance, deposits, withdrawals, and service charges
FL-7. Compute the cost for food, shelter, clothing, savings, or other expenses, based on a given fractional or percentage portion for each expense, when given a weekly or monthly income
FL-8. Use estimation in everyday situations involving time, money, distance, weight, or capacity
FL-9. Measure time, temperature, distance, capacity, or weight

GRADE OR COURSE 6

Preliminary (written) Survey of Math Teachers

Part I: Items previously approved by SDE and identified as important from interviews with superintendents and designated math teachers (usually Department Chair) for District.

1) Students master basic mathematics skills: 1) far behind 2) behind 3) on schedule 4) ahead 5) far ahead
2) Need increased emphasis on problem solving and higher cognitive skills in mathematics: 1) very low priority 2) low priority 3) average priority 4) high priority 5) very high priority
3) A symposium needs to be held to develop a more specific and comprehensive definition of math skills in the work place 1) very low priority 2) low priority 3) average priority 4) high priority 5) very high priority
4) Greater linkage needs to be created between the teaching of reading and the teaching of math at the elementary level: 1) very low priorty 2) low priority 3) average priority 4) high priority 5) very high priority
5) Incentives need to be provided for teachers to participate in summer math institutes and to take additional college courses in mathematics: 1) very low priority 2) low priority 3) average priority 4) high priority 5) very high priority
6) Remediation be required for any student scoring below 35 percent correct on the BSAP in mathematics: 1) very low priority 2) low priority 3) average priority 4) high priority 5) very high priority
7) Math teachers need to have access to a network for reporting reseach findings in the cognitive sceinces and up-to-date teaching methods: 1) very low priority 2)low priority 3) average priority 4) high priority 5) very high priority
8) Math teachers need a newsletter to include announcements of important events, issues, programs, and materials available for classroom instruction and to serve as a vehicle for feedback from mathematics teachers: 1) very low priority 2) low priority 3) average priority 4) high priority 5) very high priority
9) Mathematics staff development activities need to be integrated into instructional programs: 1) very low priority 2) low priority 3) average priority 4) high priority 5) very high priority
10) District needs to encourage teachers to attend mathematics workshops, even it that involves absences from school: 1) very low priority 2) low priority 3) average priority 4) high priority 5) very high priority
11) My district could benefit from assistance provided by regional universities in developing programs designed to master mathematics curriculum objectives: 1) very low priority 2) low priority 3) average priority 4) high priority 5) very high priority

APPENDIX B

Part II: New items suggested through interview process with superintendents and teachers.

12) Ready-to-use testing materials on mathematics objectives be provided to classroom teacher to chart progress of each student on mathematics curriculum objectives: 1) very low priority 2) low priority 3) average priority 4) high priority 5) very high priority
13) Ready-to-use re-teaching materials for mathematics remediation be available to teachers: 1) very low priority 2) low priority 3) average priority 4) high priority 5) very high priority
14) Information be made available to teachers on specific mathematics objectives causing the greatest regional (Mississippi Delta) problems at their grade level: 1) very low priority 2) low priority 3) average priority 4) high priority 5) very high priority
15) Regional data on math objective performance should be made available to teachers on students enrolled in similar school districts (matched for size, rural-urban dimensions, socioeconomic factors, etc.) 1) very low priority 2) low priority 3) average priority 4) high priority 5) very high priority
16) A study needs to be conducted evaluating the suitability of the district's textbooks for assisting in mastery of mathematics objectives: 1) very low priorty 2) low priority 3) average priority 4) high priority 5) very high priority

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Part III: Teachers are asked to evaluate the mathematics curriculum objectives for their specific grade level.

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GRADE 6

CONFIDENTIAL: Only faculty at Delta State will have access to data.

Age_____ Number of Years Teaching_____ School Name_____

Are you teaching on an Emergency Certificate? Yes_____ No_____

Please circle the number of mathematics courses you took in college that were beyond the minimum graduation requirements for all students on campus.

Number of Courses: 0 1 2 3 4 5 6 7 8 9 10 11 12

OBJ. #	OBJECTIVE DESCRIPTION	IS THIS APPROPRIATE OR INAPPROPRIATE FOR YOUR STUDENTS? (Y=Yes; N=No) Y	N	ABOUT WHAT PERCENTAGE OF YOUR STUDENTS HAVE MASTERED THIS OBJECTIVE PUT DK, IF YOU DON'T KNOW.
81	Divide a three-digit number by a two- or three- digit number with or without remainders			
82	Add, subtract, multiply and divide any given number of digits			
83	Simplify expressions involving two or three operations			
84	Simplify expressions involving more than one operation including symbols of grouping			
85	Estimate sum and difference of whole number computational problems			
94	Simplify proper fractions			
95	Add two proper fractions with like denominators, renaming the sum			
96	Subtract two proper fracations with like denominators, renaming the difference			
98	Multiply a whole number and a proper fraction			
101	Use $>$, $<$, or = correctly with proper fractions			
107	Multiply whole numbers by tenths			
108	Divide a decimal number through tenths by a whole number			
109	Add, subtract, multiply and divide decimals with up to three digits			
120	Write a ratio as a fracation or percent			
121	Find the missing number in a proportion			
122	Define percent.			
123	Recognize the percent symbol			
124	Convert % to fraction or decimal, fraction to % or decimal, and decimal to % or fraction			
125	Solve a percent problem, finding the percentage			
126	Solve a percent problem, finding the base			
127	Solve a percent problem, finding the rate			
165	Round money values to the nearest dollar			
166	Complete a check and its stub			
168	Add, subtract, multiply units of time			
178	Select the correct number sen. to solve a word problem involving one of the four operations			
179	Select the correct number sen. to solve a word problem involving proper fractions			
180	Select the correct number sen. to solve add. and sub. word problems involving mixed numerals			
181	Select the correct number sen. to solve mult. word problems involving whole numbers and fractions			
182	Select the correct number sen. to solve division word problems involving whole numbers			
184	Select the correct number sen to solve mult. and div. word problems using decimal & whole numbers			
185	Select the correct number sen. to solve division word problems using decimals and whole numbers			
187	Select the correct number sen. to solve a two-step word problem involving whole numbers			
189	Solve two-step word problems involving whole numbers			